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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/707,892	01/21/2004	Tien-Jen Cheng	FIS920030352US1	1891
32074 7590 08/11/2009 INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 321-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533			EXAMINER LEE, EUGENE	
			ART UNIT 2815	PAPER NUMBER
			NOTIFICATION DATE 08/11/2009	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

EFIPLAW@US.IBM.COM

Office Action Summary	Application No.	Applicant(s)	
	10/707,892	CHENG ET AL.	
	Examiner	Art Unit	
	EUGENE LEE	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 May 2009.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5, 7-14 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5, 7-14 and 21-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 May 2009 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date. _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, (1) adhesion layer (i.e. claim 2), and collapsible chip connections (i.e. claim 5) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as “amended.” If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 2, thru 4, and 8 thru 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 8-14, it is unclear whether the limitation “adhesion/barrier layer” is referring to two separate layers or one layer. For the sake of compact prosecution, the Examiner is interpreting this limitation to be inclusive of a single layer with dual properties or two layers wherein each layer has a respective property; however, appropriate clarification and/or correction are required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 thru 5, 7 thru 14, and 21 thru 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Degani et al. 6,232,212 B1 in view of Hosomi et al. 5,631,499. Degani discloses (see, for example, FIG. 8) a UBM (durable chip pad) comprising an Al contact (terminal metal layer) 13, first layer (diffusion barrier layer) 21, second layer (adhesion layer) 22, copper layer (conducting layer pad) 23, and gold layer (plate passivating layer) 24. Degani does not disclose a hard test barrier layer. However, Hosomi discloses (see, for example, FIG. 31) a semiconductor device comprising a second thin metal film (hard test barrier layer) 2b in

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between two other metal layers. In column 7, lines 31-33, Hosomi discloses the metal film extending onto the passivation film beyond the edge of barrier metal that the edge of the barrier metal is protected from side-etching. It would have been obvious to one of ordinary skill in the art at the time of invention to have a hard test barrier metal in order to protect the metal layers underneath it from side-etching.

Regarding the limitation “one pad in a pad array of identical durable chip pad”, see, for example, column 1, lines 31-33, wherein Degani discloses arrays of I/O contact pads.

Regarding the limitation “being directly probable”, see, for example, FIG. 31 of Hosomi wherein Hosomi discloses the layer 2b being exposed and therefore “being directly probable”.

Regarding the limitation “at said hard test barrier layer during chip performance testing and prior to any additional far back end of the line (FBEOL) processing”, it has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. *Ex Parte Masham*, 2 USPQ F. 2d 1647 (1987).

Regarding claims 2, and 4, see, for example, column 3, line 47 wherein Degani discloses the second layer (adhesion layer) 22 as Cr/Cu.

Regarding claim 3, see, for example, column 3, line 41 wherein Degani discloses the first layer (barrier metallurgy) 21 as Ti.

Regarding claim 4, see, for example, column 8, line 18 wherein Hosomi discloses the second thin metal film (hard test barrier layer) 2b as nickel.

Regarding claims 5, 14, and 25, see, for example, FIG.8 wherein Degani discloses a solder bump (collapsible chip connections) 71. Regarding the limitation "collapsible chip

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connections on each probed said durable chip pad at bump pitches finer than 3 mils", Degani in view of Hosomi does not disclose collapsible chip connections on each probed said durable chip pad at bump pitches finer than 3 mils. However, it was well within the skills of an artisan in the art to optimize the performance of a semiconductor device by adjusting the bump pitch in order to connect the device to other wafers or semiconductor devices. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have the collapsible chip connections on each probed said durable chip pad at bump pitches finer than 3 mils because it was well within the skills of an artisan to optimize the performance of a semiconductor device by adjusting the bump pitch in order to connect the device to other wafers or semiconductor devices without bumps adhering to each other, etc. and strong enough, and since it has been held that discovering an optimum value of a result effective value involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 7, see, for example, column 3, line 64 wherein Degani discloses the gold layer (plate passivating layer) 24.

Regarding claims 8-11, and 13, see, for example, FIG. 8 wherein Degani discloses a UBM (durable chip pad) comprising an Al contact (terminal metal layer) 13, second layer/ first layer (adhesion layer/ diffusion barrier layer) 22/ 21, copper layer (seed pad) 23, and gold layer (plate passivating layer) 24.

Regarding claims 12, and 21, Degani in view of Hosomi discloses the claimed invention except for a 0.5-30 um thick nickel layer. However, it would have been obvious to one of ordinary skill in the art at the time of invention was made to have a 0.5-30 um thick nickel layer in order to adequately cover the underlying metal layers, and since it has been held that

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discovering an optimum value of a result effective value involves only routine skill in the art. In re Boesch, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

5. Applicant's arguments with respect to claims 1-5, 7-14, and 21-25 have been considered but are moot in view of the new ground(s) of rejection.

Regarding the 112 rejection and the applicant's argument on page 9 of the amendment filed 5/20/09 that the recited layer is two layers, this argument is not persuasive. It is still not clear whether the adhesion/barrier layer is two layers or one layer with dual properties. The applicant's argument is further unclear because the applicant first states the recited layer is a layer with two properties which could be a single TiN layer; however, the applicant further argues that the adhesion/barrier layer is two layers. For the sake of compact prosecution, the Examiner is interpreting this limitation to be inclusive of a single layer with dual properties or two layers wherein each layer has a respective property; however, appropriate clarification and/or correction are required.

Regarding the 103 rejection, the Degani in view of Hosomi rejection involves the combination wherein the hard test barrier layer 2b of Hosomi (FIG. 31 of Hosomi) is inserted in between the plate passivating layer 24 and conducting layer pad 23 of Degani (FIG. 8 of Degani). The Examiner purports that the layer 2a of Hosomi is analogous to the layer 24 of Degani since both layers directly contact the overlying bump. The addition of the layer 2b of Hosomi would protect all the layers (i.e. layers 23, 22, 21 of Degani) underneath the layer 24 of Degani. The layer 23, 22, 21 of Degani are different than the layer 24 because layers 23, 22, 21 are directly used for the composite structure for the UBM whereas the layer 24 is an optional

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layer strictly used for adhering the bump to the UBM. In this case, the layer 3 of Hosomi is analogous to the UBM layers 23, 22, 21 of Degani, and layer 2a of Hosomi is analogous to the layer 24 of Degani. Therefore, it would have been obvious to one of ordinary skill in the art to add this new extra layer 2b of Hosomi into the structure of Degani (in between the layer 24, and collectively layers 23, 22, 21) and have the layer 2b of Hosomi contact the top surface of layer 14 of Degani in order to prevent etching of the layers 23, 22, 21 of Degani. In other words, the Examiner is not replacing any layers as argued by the applicant on page 11, second paragraph but rather adding a layer 2b of Hosomi into Degani's structure and having it terminate on the top surface of layer 14 of Degani.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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INFORMATION ON HOW TO CONTACT THE USPTO

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENE LEE whose telephone number is (571)272-1733. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Eugene Lee
August 4, 2009
/Eugene Lee/
Primary Examiner, Art Unit 2815